Project Title: Practitioner Level Opioid Safety Measure Development

Date:

Information included is current on as of 1/5/2021

Project Overview:

The Centers for Medicare & Medicaid Services (CMS) has contracted with the University of Michigan Kidney Epidemiology and Cost Center to develop practitioner level measures in the area of opioid safety for dialysis patients. The contract name is Kidney Disease Quality Measure Development, Maintenance, and Support. The contract number is 75FCMC18D0041, task order number 75FCMC18F0001. As part of its measure development process, CMS asks measure developers to convene groups of stakeholders and experts who contribute direction and thoughtful input to the measure developer during measure development and maintenance.

Measure Name/ Title (NQF Submission Form De.2.)

Unsafe Opioid Prescriptions at the Prescriber Group Level

1. Type of Measure (NQF Submission Form De.1., NQF Evidence Attachment 1a.1.)

☒process
☐process: appropriate use
☐outcome
☐cost/resource use
☐efficiency
☐outcome: patient-reported outcome-based performance measure (PRO-PM)
☐structure
☐outcome: intermediate outcome
☐composite

2. Importance (NQF Importance Tab)

2.1 Evidence to Support the Measure Focus (for reference only) (NQF Evidence Attachment Subcriterion 1a).

2.1.1 This is a Measure of: (should be consistent with type of measure entered in NQF Measure Submission Form De.1) (NQF Evidence Attachment 1a.1)

☒process: *Percentage of all dialysis patients attributable to a opioid prescriber's group practice who had an unsafe opioid prescription written*
☐outcome
☐process: appropriate use
☐outcome: PRO
☐cost/resource use
☐efficiency
☐structure
☐intermediate outcome
☐composite

2.1.2 Logic Model (NQF Evidence Attachment 1a.2)

Several observational studies have demonstrated an association between unsafe opioid use in the dialysis population and higher risk of fall/fracture, hospitalization, and mortality. Unsafe opioid use is typically defined as >50 morphine milligram equivalents (MME), duration > 90 days, or co-prescription with a benzodiazepine.

The measure focus is the process determining the percentage of all dialysis patients attributable to an opioid prescriber's group practice who had an unsafe opioid prescription written within the year.

This process leads to improvement in fractures, hospitalizations, and mortality as follows:

Measure percentage of patients with unsafe opioid prescriptions → Assess value → Identify patients who have an unsafe opioid prescription → Evaluate/change pain management (decrease dose, consider alternative agent, avoid co-prescription with benzodiazepine) → lower percentage of unsafe opioid prescription →Lower patient fractures, hospitalizations, and mortality.

2.1.3 Value and Meaningfulness (NQF Evidence Attachment 1a.3)

N/A

2.1.4 Empirical Data (for outcome measures) – as applicable (NQF Evidence Attachment 1a.2)

N/A

2.1.5 Systematic Review of the Evidence (for intermediate outcome, process, or structure performance measures, include those that are instrument-based) – as applicable (NQF Evidence Attachment 1a.3)

N/A

2.1.6 Other Source of Evidence – as applicable (NQF Evidence Attachment 1a.4)

2.1.6.1 Briefly Synthesize the Evidence (NQF Evidence Attachment 1a.4.1)

Pain is among the most commonly reported symptom of patients on dialysis and patients with end stage renal disease (ESRD) report more pain than those in the general population. ESRD patients may be especially vulnerable to opioid-related complications due to multiple comorbidities, polypharmacy, and reduced clearance by the kidney of active drug metabolites. However, opioid use is common among patients receiving dialysis with estimates of use indicating that >60% receive an opioid prescription in a given year. In addition, over 20% of ESRD patients use opioids chronically, defined as >90 days in a calendar year. These rates of opioid prescription in the ESRD population are approximately three times that seen in the general Medicare population. Significant geographic variation in opioid prescriptions has been reported at both the state and dialysis facility [Bailie 2004] level.

In 2016, the CDC released guidelines for opioid prescription in an effort to ensure safe and effective treatment of chronic pain, while reducing the risk of addiction, overdose and death. These guidelines call for increased discussion and follow up between patients and providers, use of the lowest dose/duration possible, and consideration for non-opioid treatment modalities. Other recommendations note that depression, anxiety, and sleep disorders are associated with pain and should be considered in patient assessment.

Higher doses of opioids in the ESRD population have been associated with increased risk of falls and fractures compared to lower doses (which still impose some incremental risk)[Ishida, 2018]. Other

authors, using USRDS data through 2010 reported that higher opioid doses correlated with death in a monotonically increasing fashion [Kimmel, 2017].

Co-prescription of benzodiazepines has been reported in 30% of opioid prescriptions [Ruchi 2019] in the ESRD population and increased the odds of hospitalization by 50%. The prevalence of opioid and benzodiazepine use in dialysis patients is highly variable between centers [Paramanandam 2011]. These findings suggests an opportunity exists for greater use of state Prescription Drug Monitoring Programs (PDMP), which have been demonstrated to reduce opioid MME doses [Change 2016] as well as opioid related mortality [Patrick, 2016].

Dialysis patients with chronic opioid prescriptions (>90 days) had increased mortality, dialysis discontinuation, and hospitalization when compared with patients without an opioid prescription [Kimmel, 2017]. However, when patients in the general population who receive chronic opioids also received a naloxone prescription, there were 47% fewer opioid-related ED visits per month in the 6 months after receipt of the naloxone prescription [Coffin, 2016].

In summary, there is evidence in the literature to link unsafe opioid prescription practices to serious adverse event, such as hospitalization and mortality, in the dialysis population. Furthermore, interventions such as use of PDMPs and co-prescription of naloxone have been demonstrated to reduce these risks.

2.1.6.2 Process Used to Identify the Evidence (NQF Evidence Attachment 1a.4.2)

The following search was conducted in Pubmed in February 2019

("kidney failure, chronic"[MeSH Terms] OR ("kidney"[All Fields] AND "failure"[All Fields] AND "chronic"[All Fields]) OR "chronic kidney failure"[All Fields] OR "esrd"[All Fields]) AND ("analgesics, opioid"[Pharmacological Action] OR "analgesics, opioid"[MeSH Terms] OR ("analgesics"[All Fields] AND "opioid"[All Fields]) OR "opioid analgesics"[All Fields] OR "opioid"[All Fields])

This returned 268 articles that were reviewed and of these 43 were selected for presentation to the Technical Expert Panel that was convened to make recommendations regarding this measure. Articles relevant to the summary above are included in 3.1.6.3.

2.1.6.3 Citation(s) for the Evidence (NQF Evidence Attachment 1a.4.3)

Daubresse M, Alexander GC, Crews DC, Segev DL, McAdams-DeMarco MA. Trends in Opioid Prescribing Among Hemodialysis Patients, 2007-2014. Am J Nephrol. 2019;49(1):20-31. doi: 10.1159/000495353. Epub 2018 Dec 13. PMID: 30544114; PMCID: PMC6341485.

Abstract

Background: Hemodialysis (HD) patients frequently experience pain. Previous studies of HD patients suggest increased opioid prescribing through 2010. It remains unclear if this trend continued after 2010 or declined with national trends.

Methods: Longitudinal cohort study of 484,745 HD patients in the United States Renal Data System/Medicare data. We used Poisson/negative binomial regression to estimate annual incidence rates of opioid prescribing between 2007 and 2014. We compared prescribing rates with the general US population using IQVIA's National Prescription Audit data. Outcomes included the following: percent of HD patients receiving an opioid prescription, rate of opioid

prescriptions, quantity, days supply, morphine milligram equivalents (MME) dispensed per 100 person-days, and prescriptions per person.

Results: In 2007, 62.4% of HD patients received an opioid prescription. This increased to 63.2% in 2010 then declined to 53.7% by 2014. Opioid quantity peaked in 2011 at 73.5 pills per 100 person-days and declined to 62.6 pills per 100 person-days in 2014. MME peaked between 2010 and 2012 then declined through 2014. In 2014, MME rates were 1.8-fold higher among non-Hispanic patients and 1.6-fold higher among low-income patients. HD patients received 3.2-fold more opioid prescriptions per person compared to the general US population and were primarily prescribed oxycodone and hydrocodone. Between 2012 and 2014, HD patients experienced greater declines in opioid prescriptions per person (18.2%) compared to the general US population (7.1%).

Conclusion: Opioid prescribing among HD patients declined between 2012 and 2014. However, HD patients continue receiving substantially more opioids than the general US population.

Ruchi R, Bozorgmehri S, Ozrazgat-Baslanti T, Segal MS, Shukla AM, Mohandas R, Kumar S. Opioid Safety and Concomitant Benzodiazepine Use in End-Stage Renal Disease Patients. Pain Res Manag. 2019 Oct 20;2019:3865924. doi: 10.1155/2019/3865924. PMID: 31772694; PMCID: PMC6854236.

Abstract

Background. Opioid use is common in end-stage renal disease (ESRD) patients. However, safety of individual opioids and concomitant benzodiazepine use has not been studied. Objective. To study the epidemiology of opioid and concomitant benzodiazepine use in ESRD population. To study the clinical safety profile of individual opioids in patients on hemodialysis. Design. Retrospective analysis of the U.S. Renal Data System. A comprehensive review of the current literature was performed to update currently used opioid safety classification. Participants. ESRD patients ≥18 years on hemodialysis who were enrolled in Medicare A and B and Part D between 2006 and 2012, excluding those with malignancy. Main Measures. Hospital admission with diagnosis of prescription opioid overdose within 30, 60, and 90 days of prescription; death due to opioid overdose. Results. Annually, the percentage of patients prescribed any opioid was 52.2%. Overall trend has been increasing except for a small dip in 2011, despite which the admissions due to opioid overdose have been rising. 30% of those who got a prescription for opioids also got a benzodiazepine prescription. 56.5% of these patients received both prescriptions within a week of each other. Benzodiazepine use increased the odds of being on opioids by 3.27 (CI 3.21–3.32) and increased the odds of hospitalization by 50%. Opioids considered safe such as fentanyl and methadone were associated with 3 and 6 folds higher odds of hospitalization within 30 days of prescription. Hydrocodone had the lowest odds ratio (1.9, CI 1.8–2.0). Conclusions. Concurrent benzodiazepine use is common and associated with higher risk of hospitalization due to opioid overdose. Possible opioid-associated hospital admission rate is 4-5 times bigger in ESRD population than general population. Current safety classification of opioids in these patients is misleading, and even drugs considered safe based on pharmacokinetic data are associated with moderate to very high risk of hospitalization. We propose a risk-stratified classification of opioids and suggest starting to use them in all ESRD patients.

Patrick SW, Fry CE, Jones TF, Buntin MB. Implementation Of Prescription Drug Monitoring Programs Associated With Reductions In Opioid-Related Death Rates. Health Aff (Millwood). 2016 Jul

1;35(7):1324-32. doi: 10.1377/hlthaff.2015.1496. Epub 2016 Jun 22. PMID: 27335101; PMCID: PMC5155336.

Abstract

Over the past two decades the number of opioid pain relievers sold in the United States rose dramatically. This rise in sales was accompanied by an increase in opioid-related overdose deaths. In response, forty-nine states (all but Missouri) created prescription drug monitoring programs to detect high-risk prescribing and patient behaviors. Our objectives were to determine whether the implementation or particular characteristics of the programs were effective in reducing opioid-related overdose deaths. In adjusted analyses we found that a state's implementation of a program was associated with an average reduction of 1.12 opioid-related overdose deaths per 100,000 population in the year after implementation. Additionally, states whose programs had robust characteristics-including monitoring greater numbers of drugs with abuse potential and updating their data at least weekly-had greater reductions in deaths, compared to states whose programs did not have these characteristics. We estimate that if Missouri adopted a prescription drug monitoring program and other states enhanced their programs with robust features, there would be more than 600 fewer overdose deaths nationwide in 2016, preventing approximately two deaths each day.

Chang HY, Lyapustina T, Rutkow L, Daubresse M, Richey M, Faul M, Stuart EA, Alexander GC. Impact of prescription drug monitoring programs and pill mill laws on high-risk opioid prescribers: A comparative interrupted time series analysis. Drug Alcohol Depend. 2016 Aug 1;165:1-8. doi: 10.1016/j.drugalcdep.2016.04.033. Epub 2016 Jun 2. PMID: 27264166; PMCID: PMC4985620.

Abstract

Background: Prescription drug monitoring programs (PDMPs) and pill mill laws were implemented to reduce opioid-related injuries/deaths. We evaluated their effects on high-risk prescribers in Florida.

Methods: We used IMS Health's LRx Lifelink database between July 2010 and September 2012 to identify opioid-prescribing prescribers in Florida (intervention state, N: 38,465) and Georgia (control state, N: 18,566). The pre-intervention, intervention, and post-intervention periods were: July 2010-June 2011, July 2011-September 2011, and October 2011-September 2012. High-risk prescribers were those in the top 5th percentile of opioid volume during four consecutive calendar quarters. We applied comparative interrupted time series models to evaluate policy effects on clinical practices and monthly prescribing measures for low-risk/high-risk prescribers.

Results: We identified 1526 (4.0%) high-risk prescribers in Florida, accounting for 67% of total opioid volume and 40% of total opioid prescriptions. Relative to their lower-risk counterparts, they wrote sixteen times more monthly opioid prescriptions (79 vs. 5, $p<0.01$), and had more prescription-filling patients receiving opioids (47% vs. 19%, $p<0.01$). Following policy implementation, Florida's high-risk providers experienced large relative reductions in opioid patients and opioid prescriptions (-536 patients/month, 95% confidence intervals [CI] -829 to -243; -847 prescriptions/month, CI -1498 to -197), morphine equivalent dose (-0.88mg/month, CI

-1.13 to -0.62), and total opioid volume (-3.88kg/month, CI -5.14 to -2.62). Low-risk providers did not experience statistically significantly relative reductions, nor did policy implementation affect the status of being high- vs. low- risk prescribers.
Conclusions: High-risk prescribers are disproportionately responsive to state policies. However, opioids-prescribing remains highly concentrated among high-risk providers.

Coffin PO, Behar E, Rowe C, Santos GM, Coffa D, Bald M, Vittinghoff E. Nonrandomized Intervention Study of Naloxone Coprescription for Primary Care Patients Receiving Long-Term Opioid Therapy for Pain. Ann Intern Med. 2016 Aug 16;165(4):245-52. doi: 10.7326/M15-2771. Epub 2016 Jun 28. PMID: 27366987; PMCID: PMC5783639.

Abstract

Background: Unintentional overdose involving opioid analgesics is a leading cause of injury-related death in the United States.

Objective: To evaluate the feasibility and effect of implementing naloxone prescription to patients prescribed opioids for chronic pain.

Design: 2-year nonrandomized intervention study.

Setting: 6 safety-net primary care clinics in San Francisco, California.

Participants: 1985 adults receiving long-term opioid therapy for pain.

Intervention: Providers and clinic staff were trained and supported in naloxone prescribing.

Measurements: Outcomes were proportion of patients prescribed naloxone, opioid-related emergency department (ED) visits, and prescribed opioid dose based on chart review.

Results: 38.2% of 1985 patients receiving long-term opioids were prescribed naloxone. Patients prescribed higher doses of opioids and with an opioid-related ED visit in the past 12 months were independently more likely to be prescribed naloxone. Patients who received a naloxone prescription had 47% fewer opioid-related ED visits per month in the 6 months after receipt of the prescription (incidence rate ratio [IRR], 0.53 [95% CI, 0.34 to 0.83]; P = 0.005) and 63% fewer visits after 1 year (IRR, 0.37 [CI, 0.22 to 0.64]; P < 0.001) compared with patients who did not receive naloxone. There was no net change over time in opioid dose among those who received naloxone and those who did not (IRR, 1.03 [CI, 0.91 to 1.27]; P = 0.61).

Limitation: Results are observational and may not be generalizable beyond safety-net settings.

Conclusion: Naloxone can be coprescribed to primary care patients prescribed opioids for pain. When advised to offer naloxone to all patients receiving opioids, providers may prioritize those with established risk factors. Providing naloxone in primary care settings may have ancillary benefits, such as reducing opioid-related adverse events.

Ishida JH, McCulloch CE, Steinman MA, Grimes BA, Johansen KL. Opioid Analgesics and Adverse Outcomes among Hemodialysis Patients. Clin J Am Soc Nephrol. 2018 May 7; 13(5):746-753. doi: 10.2215/CJN.09910917 Epub 2018 Apr 19.

ABSTRACT

BACKGROUND AND OBJECTIVES:

Patients on hemodialysis frequently experience pain and may be particularly vulnerable to opioid-related complications. However, data evaluating the risks of opioid use in patients on hemodialysis are limited.

DESIGN, SETTING, PARTICIPANTS, & MEASUREMENTS:

Using the US Renal Data System, we conducted a cohort study evaluating the association between opioid use (modeled as a time-varying exposure and expressed in standardized oral morphine equivalents) and time to first emergency room visit or hospitalization for altered mental status, fall, and fracture among 140,899 Medicare-covered adults receiving hemodialysis in 2011. We evaluated risk according to average daily total opioid dose (>60 mg, ≤60 mg, and per 60-mg dose increment) and specific agents (per 60-mg dose increment).

RESULTS:

The median age was 61 years old, 52% were men, and 50% were white. Sixty-four percent received opioids, and 17% had an episode of altered mental status (15,658 events), fall (7646 events), or fracture (4151 events) in 2011. Opioid use was associated with risk for all outcomes in a dose-dependent manner: altered mental status (lower dose: hazard ratio, 1.28; 95% confidence interval, 1.23 to 1.34; higher dose: hazard ratio, 1.67; 95% confidence interval, 1.56 to 1.78; hazard ratio, 1.29 per 60 mg; 95% confidence interval, 1.26 to 1.33), fall (lower dose: hazard ratio, 1.28; 95% confidence interval, 1.21 to 1.36; higher dose: hazard ratio, 1.45; 95% confidence interval, 1.31 to 1.61; hazard ratio, 1.04 per 60 mg; 95% confidence interval, 1.03 to 1.05), and fracture (lower dose: hazard ratio, 1.44; 95% confidence interval, 1.33 to 1.56; higher dose: hazard ratio, 1.65; 95% confidence interval, 1.44 to 1.89; hazard ratio, 1.04 per 60 mg; 95% confidence interval, 1.04 to 1.05). All agents were associated with a significantly higher hazard of altered mental status, and several agents were associated with a significantly higher hazard of fall and fracture.

CONCLUSIONS:

Opioids were associated with adverse outcomes in patients on hemodialysis, and this risk was present even at lower dosing and for agents that guidelines have recommended for use.

Kimmel PL, Fwu CW, Abbott KC, Eggers AW, Kline PP, Eggers PW. Opioid Prescription, Morbidity, and Mortality in United States Dialysis Patients. J Am Soc Nephrol. 2017 Dec;28(12):3658-3670. doi: 10.1681/ASN.2017010098. Epub 2017 Sep 21.

ABSTRACT

Aggressive pain treatment was advocated for ESRD patients, but new Centers for Disease Control and Prevention guidelines recommend cautious opioid prescription. Little is known regarding outcomes associated with ESRD opioid prescription. We assessed opioid prescriptions and associations between opioid prescription and dose and patient outcomes using 2006-2010 US Renal Data System information in patients on maintenance dialysis with Medicare Part A, B,

and D coverage in each study year (*n*=671,281, of whom 271,285 were unique patients). Opioid prescription was confirmed from Part D prescription claims. In the 2010 prevalent cohort (*n*=153,758), we examined associations of opioid prescription with subsequent all-cause death, dialysis discontinuation, and hospitalization controlled for demographics, comorbidity, modality, and residence. Overall, >60% of dialysis patients had at least one opioid prescription every year. Approximately 20% of patients had a chronic (≥90-day supply) opioid prescription each year, in 2010 usually for hydrocodone, oxycodone, or tramadol. In the 2010 cohort, compared with patients without an opioid prescription, patients with short-term (1-89 days) and chronic opioid prescriptions had increased mortality, dialysis discontinuation, and hospitalization. All opioid drugs associated with mortality; most associated with worsened morbidity. Higher opioid doses correlated with death in a monotonically increasing fashion. We conclude that opioid drug prescription is associated with increased risk of death, dialysis discontinuation, and hospitalization in dialysis patients. Causal relationships cannot be inferred, and opioid prescription may be an illness marker. Efforts to treat pain effectively in patients on dialysis yet decrease opioid prescriptions and dose deserve consideration.

Dowell D, Haegerich TM, Chou R. CDC Guideline for Prescribing Opioids for Chronic Pain--United States, 2016. JAMA. 2016 Apr 19;315(15):1624-45. doi: 10.1001/jama.2016.1464. Review.

ABSTRACT

This guideline provides recommendations for primary care clinicians who are prescribing opioids for chronic pain outside of active cancer treatment, palliative care, and end-of-life care. The guideline addresses 1) when to initiate or continue opioids for chronic pain; 2) opioid selection, dosage, duration, follow-up, and discontinuation; and 3) assessing risk and addressing harms of opioid use. CDC developed the guideline using the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) framework, and recommendations are made on the basis of a systematic review of the scientific evidence while considering benefits and harms, values and preferences, and resource allocation. CDC obtained input from experts, stakeholders, the public, peer reviewers, and a federally chartered advisory committee. It is important that patients receive appropriate pain treatment with careful consideration of the benefits and risks of treatment options. This guideline is intended to improve communication between clinicians and patients about the risks and benefits of opioid therapy for chronic pain, improve the safety and effectiveness of pain treatment, and reduce the risks associated with long-term opioid therapy, including opioid use disorder, overdose, and death. CDC has provided a checklist for prescribing opioids for chronic pain (http://stacks.cdc.gov/view/cdc/38025) as well as a website (http://www.cdc.gov/drugoverdose/prescribingresources.html) with additional tools to guide clinicians in implementing the recommendations.

Lentine KL, Yuan H, Tuttle-Newhall JE, Xiao H, Chawa V, Axelrod D, Brennan DC, Dharnidharka VR, Beuer C, Schnitzler MA. Quantifying prognostic impact of prescription opioid use before kidney transplantation through linked registry and pharmaceutical claims data. Transplantation. 2015 Jan;99(1):187-96. doi: 10.1097/TP.0000000000000248.

ABSTRACT

BACKGROUND: Limited data are available on the outcome implications of prescription narcotic use before kidney transplantation.

METHODS: We examined a novel database wherein national transplant registry identifiers for kidney transplant recipients were linked to records from a large U.S. pharmaceutical claims clearinghouse (2005-2010). We selected recipients with 1 year of captured pretransplant pharmaceutical fill records (N=31,197). Opioid analgesic fills in the year before transplantation were normalized to morphine equivalents (ME) and expressed as mg/kg exposures. Adjusted associations of ME level with posttransplant graft and patient survival (adjusted hazards ratio, aHR) were quantified by multivariate Cox regression.

RESULTS: Among the 29% of the sample who filled opioid prescriptions in the year before transplantation, the 25th, 50th, and 75th percentiles of annual ME were 1.8, 5.5, and 23.7 mg/kg, respectively. Three-year graft survival was 88.0% and 84.4% in live donor recipients with upper quartiles of ME use, compared with 92.0% among those who did not receive prescription narcotics (P<0.0001). Adjusted risks of posttransplant death and all-cause graft loss in live donor recipients with the highest quartile of narcotic use were 2.3 times (aHR, 2.27; 95% confidence interval, 1.66-3.10) and 1.8 times (aHR, 1.75; 95% confidence interval, 1.37-2.26), respectively, that of narcotic nonusers. Graded associations of pretransplant opioid exposure level with death and graft loss after deceased donor transplantation were also observed.

CONCLUSIONS: Although associations may in part reflect underlying conditions or behaviors, high levels of prescription opioid use before kidney transplantation predict increased risk of posttransplant death and graft loss.

Willy ME, Graham DJ, Racoosin JA, Gill R, Kropp GF, Young J, Yang J, Choi J, MaCurdy TE, Worrall C, Kelman JA. Candidate metrics for evaluating the impact of prescriber education on the safe use of extended-release/long-acting (ER/LA) opioid analgesics. Pain Med. 2014 Sep;15(9):1558-68. doi: 10.1111/pme.12459. Epub 2014 May 15.

ABSTRACT
OBJECTIVE: The objective of this study was to develop metrics to assess opioid prescribing behavior as part of the evaluation of the Extended-Release/Long-Acting (ER/LA) Opioid Analgesic Risk Evaluation and Mitigation Strategies (REMS).

DESIGN: Candidate metrics were selected using published guidelines, examined using sensitivity analyses, and applied to cross-sectional rolling cohorts of Medicare patients prescribed with extended-release oxycodone (ERO) between July 2, 2006 and July 1, 2011. Potential metrics included prescribing opioid-tolerant-only ER/LA opioid analgesics to non-opioid-tolerant patients, prescribing early fills to patients, and ordering drug screens.

RESULTS: Proposed definitions for opioid tolerance were seven continuous days of opioid usage of at least 30 mg oxycodone equivalents, within the 7 days (primary) or 30 days (secondary) prior to first opioid-tolerant-only ERO prescription. Forty-four percent of opioid-tolerant-only ERO episodes met the primary opioid tolerance definition; 56% met the secondary definition. Fills were deemed "early" if a prescription was filled before 70% (primary) or 50% (secondary) of

the prior prescription's days' supply was to be consumed. Five percent (primary) and 2% (secondary) of episodes had more than or equal to two early fills during treatment. At least one drug screen was billed in 14% of episodes. Stratified analyses indicated that older patients were less likely to be opioid tolerant at the time of the first opioid-tolerant-only ERO prescription.

CONCLUSIONS: Investigators propose three metrics to monitor changes in prescribing behaviors for opioid analgesics that might be used to evaluate the ER/LA Opioid Analgesics REMS. Low frequencies of patients, particularly those >85 years, were likely to be opioid tolerant prior to receiving prescriptions for opioid-tolerant-only ERO.

Paramanandam G, Prommer E, Schwenke DC. Opioid and benzodiazepine use in end-stage renal disease: a systematic review. J Palliat Med. 2011 Sep;14(9):1029-33. doi: 10.1089/jpm.2011.0103. Epub 2011 Aug 8.

ABSTRACT

BACKGROUND AND OBJECTIVES: Chronic pain and psychiatric disorders are common in dialysis patients, but the extent to which opioids and benzodiazepines are used is unclear. We conducted a systematic review to determine the: (1) prevalence of opioid and benzodiazepine use among dialysis patients; (2) reasons for use; (3) effectiveness of symptom control; and (4) incidence of adverse events.

DESIGN, SETTING, PARTICIPANTS, & MEASUREMENTS: Two authors reviewed all relevant citations in MEDLINE/EMBASE/CINAHL/BIOSIS Previews/Cochrane and hand-searched bibliographies. Studies after 1990 reporting prevalence estimates for opioid and/or benzodiazepine use in ≥50 dialysis patients were included.

RESULTS: We identified 15 studies from 12 countries over 1995 to 2006. Sample size ranged from 75 to 12,782. Prevalence of opioid and benzodiazepine use was variable, ranging from 5 to 36% (95% CI, 4.1 to 45.5%; n=10) and 8 to 26% (95% CI, 7.1 to 27.3%; n=9), respectively. Prevalence was positively correlated with years on dialysis. Five studies reported on the same cohorts but gave different prevalence estimates. One study verified medication use through patient interviews. Reasons for use were reported in one study. Effectiveness of pain control varied from 17 to 38%, and 72 to 84% of patients with significant pain had no analgesia (n=2). No study rigorously examined for adverse events.

CONCLUSIONS: The prevalence of opioid and benzodiazepine use in dialysis patients is highly variable between centers. Further information is needed regarding the appropriateness of these prescriptions, adequacy of symptom control, and incidence of adverse effects in this population.

Bailie GR, Mason NA, Bragg-Gresham JL, Gillespie BW, Young EW. Analgesic prescription patterns among hemodialysis patients in the DOPPS: potential for underprescription. Kidney Int. 2004 Jun;65(6):2419-25.

ABSTRACT

BACKGROUND: Dialysis patients require special consideration regarding analgesics, given their altered pharmacokinetic and pharmacodynamic profiles and increased potential for adverse reactions.

METHODS: Analgesic prescription patterns were investigated using data from the Dialysis Outcomes and Practice Patterns Study (DOPPS), with 3749 patients in 142 United States facilities studied between May 1996 and September 2001.

RESULTS: The proportion of patients prescribed any analgesic decreased from 30.2% to 24.3%; narcotic prescriptions decreased from 18.0% to 14.9%. The most commonly prescribed narcotics were propoxyphene/acetaminophen combinations (47.2%). Combinations containing acetaminophen were prescribed concurrently for 84.1% of patients on narcotics. About one half of prescriptions for narcotics, acetaminophen, and cyclooxygenase-2 (COX-2) agents were for 12 months or more; one half of prescriptions for nonsteroidal anti-inflammatory drugs (NSAIDs) were for 8 months or more. The proportion of patients prescribed analgesics varied by facility (mean +/- SD = 27.9%+/- 18.9% for all analgesics, range 0% to 89.3%). Analgesic prescription was more likely among the elderly, women, and patients with cardiovascular disease (other than coronary artery disease or congestive heart failure), lung and psychiatric disease, cancer (other than skin), and recurrent cellulitis. Patients prescribed laxatives were almost twice as likely to be on a narcotic (odds ratio = 1.95, P < 0.0001). Analgesic prescription did not correlate with loss of residual renal function or hospitalization for a gastrointestinal disorder. Three-quarters of patients reporting moderate to very severe pain were not prescribed analgesics. Furthermore, 74% of patients with pain that interfered with work had no analgesic prescription.

CONCLUSION: Dialysis patients and providers may benefit from both refinement of existing guidelines and a renewed understanding regarding appropriate prescription of analgesics.

2.2 Performance Gap – Opportunity for Improvement (NQF Measure evaluation criterion 1b)

2.2.1 Rationale (NQF Submission Form 1b.1.)

Several observational studies have demonstrated an association between unsafe opioid use in the dialysis population and higher risk of fall/fracture, hospitalization, and mortality. Unsafe opioid use is typically defined as >50 morphine milligram equivalents (MME), duration > 90 days, or co-prescription with a benzodiazepine.

The measure focus is the process determining the percentage of all dialysis patients attributable to an opioid prescriber's group practice who had an unsafe opioid prescription written within the year.

Once implemented practitioner performance on the measure can be evaluated to determine if the measure has supported and detected quality improvement in reducing unsafe opioid use, while accounting for patients where higher dose or longer term therapy may be warranted.

2.2.2 Performance Scores (NQF Submission Form 1b.2.)

Analysis of January 2017 – December 2017 data indicate the physician level mean percentage of patient months with unsafe opioid use is 39.7% (Std Dev 19.8%). Distribution of performance scores:

Min=0, Max=100, Median=38.5, Interquartile range= [25, 52.6].

N of prescriber groups=5,123, N of patients= 204,034.

2.2.3 Summary of Data Indicating Opportunity (NQF Submission Form 1b.3.)

N/A

2.2.4 Disparities (NQF Submission Form 1b.4.)

Using data from January-December 2017: age, sex, race, ethnicity, dialysis vintage, employment status, Medicare coverage, and Area Deprivation Index (ADI) were evaluated in a logistic regression model for unsafe opioid use. Data on patient level SDS/SES factors were obtained from Medicare claims and administrative data; zip code level data for the Area Deprivation Index (ADI) are obtained from Census data (2009-2013), based on patient zip-code. Below are the odds ratios for these patient characteristics.

Older age, sex, race, and ethnicity are all statistically significant predictors of unsafe opioid use. Specifically, patients had 17% higher odds of having unsafe opioid use with increasing age for those 25 years of age or younger while females had a 5% higher odds of having unsafe opioid use versus males. Hispanic ethnicity was associated with lower odds of Opioid unsafe use whereas Black race had a 35% lower odds of unsafe opioid use compared to whites. Unemployment or "other" employment status as well as dual eligible status were all associated with higher odds of Opioid unsafe use. The analysis results for age, race, sex and patient SES indicate potential disparities in unsafe opioid use. Patient-level SDS/SES variables are not included as adjustments in the measure since, in the absence of biological effects explaining these differences, risk adjustment for these factors could potentially mask disparities in care.

Odds ratio of having unsafe opioid use:

Age:

For the continuous age, the Odds Ratio (95% CI) is 1.17 (1.07, 1.27), P-value is <0.001.

For the age spline at 25 years, the Odds Ratio (95% CI) is 0.85 (0.78, 0.93), P-value is <0.001.

For the age spline at 65 years, the Odds Ratio (95% CI) is 0.98 (0.98, 0.98), P-value is <0.001.

Sex:

For Female: the Odds Ratio (95% CI) is 1.05 (1.02, 1.07), P-value is <0.001.

Male was used as the reference group.

Race:

White was used as the reference group.

For Black: the Odds Ratio (95% CI) is 0.68 (0.66, 0.7), P-value is <0.001.

For Other race: the Odds Ratio (95% CI) is 0.54 (0.52, 0.58), P-value is <0.001.

Ethnicity:

For Hispanic: the Odds Ratio (95% CI) is 0.65 (0.62, 0.68), P-value is <0.001.

Non-Hispanic was used as the reference group.

Employment Status:

Employed was used as the reference group.

For Unemployed: The Odds Ratio (95% CI) is 1.15 (1.11, 1.19), and the P-value is <0.001.

For Other: The Odds Ratio (95% CI) is 1.23 (1.19, 1.27), and the P-value is <0.001.

Medicare Coverage:

Dual eligibility: the Odds Ratio (95% CI) is 1.15 (1.13, 1.18), and the P-value is <0.001.

Non-Dual eligibility was used as the reference group.

ADI (zipcode-level):

National percentile ADI score: The Odds Ratio (95% CI) is 1.00 (1.00, 1.00), and the P-value is 0.047.

2.2.5 Provide summary of data if no or limited data (NQF Submission Form 1b.5.)

N/A

3. Scientific Acceptability (NQF Scientific Acceptability Tab)

3.1 Data Sample Description (NQF Testing Attachment 1.)

3.1.1 What Types of Data Were Used for Testing? (NQF Testing Attachment 1.1.)

☐abstracted from paper record
☒administrative claims
☒clinical database/registry
☐abstracted from electronic health record (EHR)
☐electronic clinical quality measure (eCQM) Health Quality Measure Format (HQMF) implemented in EHRs
☒other (please describe) IDR Medicare Provider table selected for MCPs

Measure tested with data from

☐abstracted from paper record
☒administrative claims
☒clinical database/registry
☐abstracted from EHRs
☐eCQM (HQMF) implemented in EHRs
☐other (please describe) IDR Medicare Provider table selected for MCPs

3.1.2 Identify the Specific Dataset (NQF Testing Attachment 1.2.)

CROWNWeb, Medicare Claims and the CMS Medical Evidence form 2728 are used as the data sources for establishing the denominator. Medicare Part D Claims are used for both the numerator and denominator. Medicare claims are used for the hospice exclusion criteria and comorbidity condition adjustments. The Medicare Provider Files from the CMS Integrated Data Repository (IDR) are used to identify practitioner's group partners.

3.1.3 What Are the Dates of the Data Used in Testing? (NQF Testing Attachment 1.3.)

National CROWNWeb data from January-December 2017.
Medicare claims data from January 2016-December 2017.

3.1.4 What Levels of Analysis Were Tested? (NQF Testing Attachment 1.4.)

Measure specified to measure performance of *(must be consistent with data sources entered in 3.22)* (NQF Submission Form S.20)

☐individual clinician
☒group/practice
☐hospital/facility/agency
☐health plan
☐other (please describe) Click or tap here to enter text.

Measure tested at level of

☐individual clinician
☒group/practice
☐hospital/facility/agency
☐health plan
☐other (please describe) Click or tap here to enter text.

3.1.5 How Many and Which Measured Entities Were Included in the Testing and Analysis? (NQF Testing Attachment 1.5.)

Patients on either home or in-center hemodialysis during the last HD treatment of the month from January-December 2017 were included in the analyses. The number of patients within each provider group ranged from 11-2411, with an average of 40 patients per group.

Public reporting of this measure on DFC or in the ESRD QIP would be restricted to physician groups with at least 11 eligible patients throughout the year for the measure. We have applied this restriction to all the reliability and validity testing reported here.

There are totally 103,157 physicians associated with 5123 physician groups, ranging from 1 to 2328 physicians per group with an average of 20 physicians per group.

3.1.6 How Many and Which Patients Were Included in the Testing and Analysis? (NQF Testing Attachment 1.6.)

There were a total of 204,034 eligible patients. Among those patient-months over the whole year, the average age was 61.2 years, 50.0 % of patient-months were female, 53.7 % were white, 41.0 % were black, 5.3 % reported race as “other”, 15.1 % were Hispanic and 47.6 % had type II diabetes as the primary cause of ESRD.

3.1.7 Sample Differences, if applicable (NQF Testing Attachment 1.7.)

N/A

3.1.8 What Were the Social Risk Factors That Were Available and Analyzed? (NQF Testing Attachment 1.8.)

Patient level:

- Employment status 6 months prior to ESRD
- Race
- Sex
- Ethnicity
- Medicare coverage*

**Assessed at a specific time point (e.g., at the reporting month). Medicare coverage in model was defined as:*
1. Medicare as primary and Medicaid
2. Medicare as primary and NO Medicaid
3. Medicare as secondary or Medicare HMO (e.g. Medicare Advantage)
4. Non-Medicare/missing

Data on patient level SDS/SES factors obtained from Medicare claims and administrative data.

ZIP code level – Area Deprivation Index (ADI) elements from Census data:

- Unemployment rate (%)
- Median family income
- Income disparity
- Families below the poverty level (%)
- Single-parent households with children <18 years old (%)
- Home ownership rate (%)
- Median home value
- Median monthly mortgage
- Median gross rent
- Population (aged 25+) with <9 years of education (%)
- Population (aged 25+) without high school diploma (%)

3.2 Reliability Testing **(for reference only)** (NQF Testing Attachment 2a.2.)

3.2.1 Level of Reliability Testing (NQF Testing Attachment 2a2.1.)

☐critical data elements used in the measure (e.g., inter-abstractor reliability; data element reliability must address all critical data elements)
☒performance measure score (e.g., signal-to-noise analysis)

3.2.2 Method of Reliability Testing (NQF Testing Attachment 2a2.2.)

We used January-December 2017 Medicare Part D claims to calculate prescriber group -level annual performance scores. Our approach for determining measure reliability aligns with one-way analysis of variance (ANOVA), in which the between- prescriber group variation (σ_b^2) and the within- prescriber group variation ($\sigma_{t,w}^2$) in the measure is determined. The inter-unit reliability (IUR) measures the proportion of the total variation of a measure ($\sigma_b^2 + \sigma_{t,w}^2$) that is attributable to the between- prescriber group variation, the true signal reflecting the differences across prescriber groups. We assessed

reliability by calculating inter-unit reliability (IUR) for the annual performance scores. If the measure were an average of individuals' measurements under the care of one prescriber group, the usual ANOVA approach would be used. The yearly based measure, however, is not a simple average and we instead estimate the IUR using a bootstrap approach, which uses a resampling scheme to estimate the within prescriber group variation that cannot be directly estimated by ANOVA. A small IUR (near 0) reveals that most of the variation of the measures between prescriber groups is driven by random noise, indicating the measure would not be a good characterization of the differences among prescriber groups, whereas a large IUR (near 1) indicates that most of the variation between prescriber groups is due to the real difference between prescriber groups.

Here we describe our approach to calculating IUR. Let T1,…,TN be the annual rate of unsafe opioid prescriptions for N prescriber groups. To generate re-sampled data, we randomly draw patients from the national population B times (we set B=100). Using each re-sampled dataset, for the ith prescriber group, we calculate an annual rate ($T^*_{i,1}$,…, $T^*_{i,B}$) and their sample variance S_i^{*2}. From this it can be seen that

$$s^2_{t,w} = \frac{\sum_{i=1}^{N}\left[(n_i - 1)S_i^{*2}\right]}{\sum_{i=1}^{N}(n_i - 1)}$$

is a bootstrap estimate of the within- prescriber group variance in the catheter rate, where ni is the number of subjects in the ith prescriber group. Calling on formulas from the one-way ANOVA, the total variation in the annual rate (i.e., $\sigma_b^2 + \sigma_{t,w}^2$) can be estimated by

$$s_t^2 = \frac{1}{n'(N-1)} \sum_{i=1}^{N} n_i (T_i - \bar{T})^2$$

where the overall weighted average of rate is $\bar{T}$ = Σ ni Ti / Σ ni,, and

$$n' = \frac{1}{N-1}\left(\sum n_i - \sum n_i^2 \Big/ \sum n_i\right)$$

is approximately the average prescriber group size (number of patients per prescriber group). Thus, the IUR = σ_b^2/ ($\sigma_b^2 + \sigma_{t,w}^2$) can be estimated by $(s_t^2 - s_{t,w}^2)/s_t^2$.

The reliability calculation only included prescriber groups with at least 11 patients during the entire year.

One limitation with the IUR is that, when many provider groups have outcomes around the national norm, the IUR can be small, though the measure can identify groups with extreme outcomes. To complement the IUR and to further assess whether the measure can identify providers with extreme outcomes, we also computed the profile IUR (PIUR) [1-3]. The PIUR, based on the measure's ability to consistently flag extreme provider groups, was computed with a two-step approach: first, we evaluated the ability of a measure to consistently profile groups with extreme outcomes; second, we mapped this reflagging ability to an IUR value computed by assuming no outlier group providers. This value was defined to be the PIUR.

Specifically, we considered a sample-splitting approach: within each provider group, we randomly split patients into two equally sized subgroups. For a given threshold (e.g. p-value<0.05), we determined whether a provider group was identified as extreme based on the first and second subgroup of patients. We repeated this process 100 times to estimate the probability that, given a provider group was classified as extreme based on the first subgroup of patients, it was also classified as extreme based on the second patient subgroup. This empirical reflagging rate was calibrated so as to identify an IUR value that would have yielded the same reflagging rate if the data had been hypothetically assumed to have no outlier provider groups. The identified IUR value would be the PIUR. If there were indeed no outlier group providers, IUR and PIUR would be equal. However, the difference between them, e.g. when the PIUR was substantially larger than the IUR, would indicate the data might have many outlier or extreme group providers that were not captured by the IUR itself.

1. He K, Dahlerus C, Xia L, Li Y, Kalbfleisch JD. The profile inter-unit reliability. Biometrics. 2019 Oct 23. doi: 10.1111/biom.13167. [Epub ahead of print]

2. Kalbfleisch JD, He K, Xia L, Li Y. Does the inter-unit reliability (IUR) measure reliability?, Health Services and Outcomes Research Methodology, 2018 Sept. 18(3), 215-225. Doi: 10.1007/s10742-018-0185-4.

3. He K, Kalbfleisch JD, Yang Y, Fei Z. Inter-unit reliability for nonlinear models. Stat Med. 2019 Feb 28;38(5):844-854. doi: 10.1002/sim.8005. Epub 2018 Oct 18.

3.2.3 Statistical Results from Reliability Testing (NQF Testing Attachment 2a2.3.)

The overall IUR is 0.86, which means 86% of the total variation of this prescriber group level measure can be explained by the differences among prescribers and not by random noise. To assess further whether the measure can identify prescriber groups with extreme values, we computed the PIUR, which is 0.98. The discrepancy between the IUR (0.86) and PIUR (0.98) indicates the existence of outlier prescriber groups that can be identified by the measure.

3.2.4 Interpretation (NQF Testing Attachment 2a2.4.)

The value obtained for the IUR is high, while the PIUR deviates from the IUR. The results demonstrates that the measure can detect differences in performance scores across provider groups as well as outlier groups.

3.3 Validity Testing **(for reference only)** (NQF Testing Attachment 2b1.)

3.3.1 Level of Validity Testing (NQF Testing Attachment 2b1.1.)

☐critical data elements (Note: Data element validity must address all critical data elements.)
☒performance measure score
☒empirical validity testing
☐systematic assessment of face validity of performance measure score as an indicator of quality or resource use (i.e., is an accurate reflection of performance on quality or resource use and can distinguish good from poor performance)

3.3.2 Method of Validity Testing (NQF Testing Attachment 2b1.2.)

Validity of the measure was tested by evaluating the concordance between the prescriber group level measure scores, hospitalization metrics, and mortality rate. The justification of our test is based on several observational studies which have demonstrated an association between unsafe opioid use in the dialysis population and higher risk of hospitalization, and mortality. Specifically, we hypothesize that the lowest tertile, T1 which has the highest proportion of unsafe opioid use, will have higher rates of hospitalization and mortality. Based on the literature reviewed, we expect this to be a moderately strong association.

We first conduct the test for the hospitalization outcomes. We divide practitioner groups, based on their measure scores, into 3 tertile classes (T1 to T3), and within each tertile class, we compute the hospitalization rates and average number of total days in the hospital in 2017. We then apply the Cochran-Armitage trend test to test the concordance between the tertile grouping and these prescriber group-level outcomes.

We use a slightly different approach for testing its association with mortality. This is because the definition of chronic opioid use, which requires that patients survive at least 90 days, may introduce selection bias (e.g. those who survived may be healthier) if we directly compare the tertile grouping with the average mortality rate within each tertile group. In fact, by doing so, we observed a reverse trend between unsafe opioid use and mortality rate. A more reasonable statistical approach is to stratify patients based on the length of time at risk during the performance period (1 month – 12 months) and then assess the association between mortality and use of opioids in each stratum. This way, we may be able to eliminate the selection bias.

3.3.3 Statistical Results from Validity Testing (NQF Testing Attachment 2b1.3.)

Cut-points for the tertiles of the performance scores were defined as follows:

T1 (worst performance): 46.2%-99.9%
T2: 30.1%-46.3%
T3 (best performance): 0-30.1%

The patient hospitalization rate at the practitioner group level is 1.49, 1.46 and 1.41 for T1, T2, and T3 respectively (trend test $p<0.001$), while the average number of hospital days per year and patient at the practitioner group level is 6.1, 5.1 and 4.1 respectively (trend test $p<0.001$).

The practitioner group level average mortality rate is 0.19, 0.20, and 0.18 per patient-year for T1, T2 and T3 groups respectively. Directly comparing the tertile grouping with the average mortality rate may yield biased results, as we stated in 2b1.2. Instead, we stratify patients based on the length of time at risk during the performance period (1 month – 12 months) and then assess the association between mortality and use of opioids in each stratum.

The table below shows the percentages of patient deaths by safe and unsafe Opioid use, stratified by months at risk. The results clearly show that, within each stratum (that is, the same at-risk set) unsafe use is associated with higher mortality.

N of months at risk	Opioid safe use, %deaths	Opioid unsafe use, %deaths
1m=1-30d	6.4%	7.1%
2m=31-60d	7.9%	9.5%
3m=61-90d	8.2%	10.7%

N of months at risk	Opioid safe use, %deaths	Opioid unsafe use, %deaths
4m=91-120d	7.7%	11.1%
5m=121-150d	7.1%	10.5%
6m=151-180d	6.2%	10.8%
7m=181-210d	5.5%	9.8%
8m=211-240d	4.8%	9.1%
9m=241-270d	3.8%	8.3%
10m=271-300d	2.7%	6.2%
11m=301-330d	2.0%	3.8%
12m=331-365d	0.7%	0.9%

3.3.4 Interpretation (NQF Testing Attachment 2b1.4.)

As hypothesized, the unsafe use of opioids is associated with more hospitalizations, longer length of hospital stay, and higher mortality, when stratified by time at risk. Specifically, when we compare similar time at risk, unsafe opioid use is associated with a 10-44% relative increase in the risk of death based on the number of months at risk. Taken together these results provide validation support for the measure in that lower rates of unsafe opioid use were associated with better performance on key outcomes.

3.4 Exclusions Analysis **(for reference only)** (NQF Testing Attachment 2b2.)

3.4.1 Method of Testing Exclusions (NQF Testing Attachment 2b2.1.)

The following exclusions are applied to the denominator:

- Patients who have a hospice claim at any time (either before or after the opioid prescription date) during the reporting period are excluded.

The prescriber group level mean percentage of patients with an unsafe opioid prescription with and without the above exclusions are calculated and compared.

3.4.2 Statistical Results from Testing Exclusions (NQF Testing Attachment 2b2.2.)

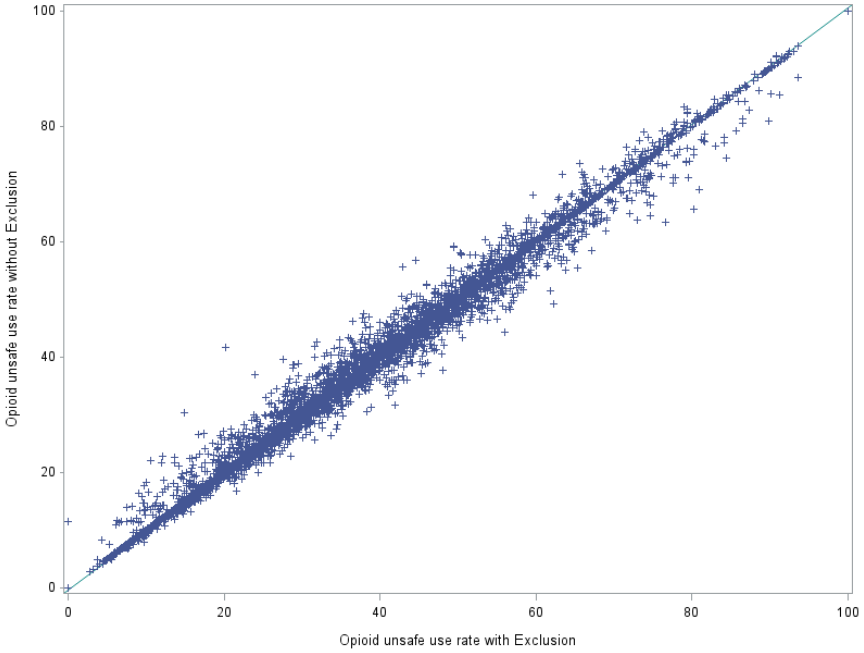
Table 1: Number and percent of unique patients excluded

Before Exclusion	After Exclusion	Percent
217,290	204,034	6.10%

Table 2: Distribution of performance scores before and after the exclusion

Opioid unsafe use rate	N	Mean	Standard Deviation	Minimum	Maximum
Before exclusion	5391	39.8	18.8	0	100
After exclusion	5123	39.3	18.8	0	100

Figure 1: Scatterplot –Opioid measure with and without measure exclusions

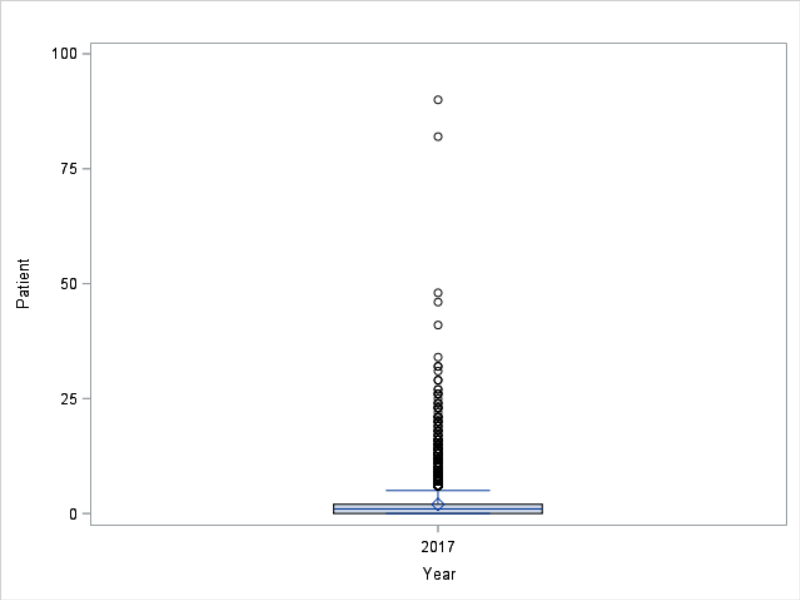


The correlation coefficient is 0.993 (p<.001).

Table 3. Comparison of performances with vs. without excluded patients

Opioid Unsafe use before exclusion	**Opioid Unsafe use after exclusion**				
	excluded due to less than 11 eligible patients	**Better than Expected**	**As Expected**	**Worse than Expected**	**Total**
Better than Expected	8 (0.2%)	292 (5.4%)	37 (0.7%)	0	337 (6.3%)
As Expected	254 (4.7%)	18 (0.3%)	4587 ((85.1%)	16 (0.3%)	4875 (90.4%)
Worse than Expected	6 (0.1%)	0	10 (0.2%)	163 (3.0%)	179 (3.3%)
Total	268 (5.0%)	310 (5.8%)	4634 (86.0%)	179 (3.3%)	5391

Figure 2. Distribution of Excluded Patients at practitioner group level for 2017



3.4.3 Interpretation (NQF Testing Attachment 2b2.3.)

The exclusion criteria are necessary since the percentage of patients excluded with each practitioner group is not evenly distributed across practitioners (Distribution shown in the boxplot). Due to the unequal distribution across practitioner groups, the exclusion criteria take into account that some practitioners treat a higher portion of patients with limited life expectancy. Additionally, our results shown in both the scatter-plot (Figure 1) as well as the Pearson Correlation Coefficient of 0.993 (p-value <0.0001) between the mean percentage of patients with Opioid unsafe use with and without the exclusion suggests that the overall impact of the exclusion on the measure's validity is not substantial since the two are highly correlated.

3.5 Risk Adjustment or Stratification for Outcome or Resource Use Measures **(for reference only)** (NQF Testing Attachment 2b3.)

3.5.1 Method of Controlling for Differences (NQF Testing Attachment 2b3.1.)

The method of controlling for differences in case mix is

☐no risk adjustment or stratification
☒statistical risk model with 178 risk factors
☐stratification by (specify number) risk categories
☐other (please describe) Click or tap here to enter text.

The patient characteristics included in the model as covariates are:

- Age: Age is included as a continuous variable, and two binary variables based on whether the patient is 25+ years old, or 65+ years old respectively.
- Sex
- BMI at incidence

    - BMI < 18.5
    - 18.5 ≤ BMI < 25
    - 25≤ BMI < 30
    - BMI ≥30
- Duration of ESRD:
    - Less than one year
    - 1-2 years
    - 2-3 years
    - 3-6 years
    - 6+ years
- Nursing home status in previous year
    - None (0 days)
    - Short term (0-89 days)
    - Long term >=90 days)
- Diabetes as primary cause of ESRD
- Comorbidities at ESRD incidence:
    - Congestive heart failure
    - Atherosclerotic heart disease and other cardiac disease
    - Cerebrovascular disease, CVA, TIA
    - Peripheral vascular disease
    - Amputation
    - Diabetes other than as primary cause of ESRD (all types including diabetic retinopathy)
    - Chronic obstructive pulmonary disease
    - Inability to ambulate
    - Inability to transfer
    - Malignant neoplasm, cancer
    - Tobacco use (current smoker)
    - Alcohol dependence
    - Drug dependence
    - No Medical Evidence (CMS-2728) Form
    - At least one of the comorbidities listed
- A set of prevalent comorbidities based on Medicare inpatient claims (individual comorbidities categorized into 149 groups – see below)

3.5.2 Rationale for Why There Is No Need for Risk Adjustment (NQF Testing Attachment 2b3.2.)

N/A

3.5.3 Conceptual, Clinical, and Statistical Methods (NQF Testing Attachment 2b3.3.a.)

In general, adjustment factors for this measure were selected based on several considerations. We began with selecting patient characteristics (listed above) that have been reported in the literature to be significant when considering opioid use in patients who are on dialysis and were supported by our Technical Expert Panel. Prior studies have indicated that younger patients, women, longer dialysis vintage, nursing home residence, and certain comorbidities are all associated with higher rates of opioid use in the dialysis population. These characteristics define our “base” model. Factors considered appropriate were then investigated with statistical models to determine if they were related to unsafe opioid use.

We then used the Agency for Healthcare Research and Quality (AHRQ) Clinical Classifications Software (CCS) diagnosis categories for prevalent comorbidity selection. First, we selected 241 of 283 prior year comorbidity groupers as potential candidates that had a prevalence greater than 0.1% in our population. Next, we used a step-wise variable selection approach (with a p-value cutoff of 0.01 in a logistic model) to identify 149 comorbidity variables that were associated with unsafe opioid use. More cutting edge machine learning techniques (such as LASSO) confirmed the results.

3.5.4 Conceptual Model of Impact of Social Risks (NQF Testing Attachment 2b3.3b.)

How was the conceptual model of how social risk impacts this outcome developed? Check all that apply.

☐published literature
☒internal data analysis
☐other (please describe) Click or tap here to enter text.

3.5.5 Statistical Results (NQF Testing Attachment 2b3.4a.)

Table 4a. Estimated Model Coefficients and p-values

Covariate	Estimate	Odds Ratio	P-value
Age			
Continuous (years)	0.110	1.11605	0.00426
Spline at 14 years	-0.113	0.89358	0.00353
Spline at 60 years	-0.016	0.98418	0
Female	-0.036	0.96468	0.00473
BMI			
<18.5	-0.014	0.98661	0.70942
18.5-24.9	reference		
25-29.9	-0.003	0.99752	0.8819
>=30	0.074	1.07724	0
Time on ESRD			
< 1 year	reference		
1-2 years	0.332	1.39379	0
2-3 years	0.419	1.52083	0
3-6 years	0.426	1.53086	0
>=6 years	0.502	1.65176	0
Nursing home during the prior 365 days			
No nursing home care (0 days)	reference		
Short-term nursing home care (1-89 days)	-0.056	0.94583	0.0019
Long-term nursing home care (>=90 days)	0.210	1.23384	0
Cause of ESRD: Diabetes	-0.082	0.92127	0
Comorbidities at start of ESRD			
Diabetes	-0.029	0.97137	0.1981
Congestive heart failure	-0.015	0.98501	0.34601

Covariate	Estimate	Odds Ratio	P-value
Coronary Artery Disease	0.038	1.0382	0.01822
Cerebrovascular disease, CVA, TIA	-0.061	0.94058	0.00978
Peripheral vascular disease	0.015	1.01505	0.49303
Amputation	0.072	1.0748	0.04277
Chronic obstructive pulmonary disease	0.144	1.15484	0
Tobacco use (current smoker)	0.080	1.08364	0.00065
Malignant neoplasm, Cancer	0.065	1.06686	0.0333
Alcohol dependence	0.056	1.05804	0.27343
Drug dependence	0.147	1.15791	0.00145
Inability to ambulate	0.096	1.10083	0.00806
Inability to transfer	-0.021	0.97936	0.69183
At least one of the comorbidities listed	0.030	1.03012	0.10142
No Medical Evidence (CMS-2728)	-0.062	0.9404	0.23439

Table 4b. **Prevalent Comorbidity Coefficients**

Covariate	Estimate	Odds Ratio	P-value
Prevalent Comorbidities (condition groups)			
Tuberculosis	-0.236	0.79017	0.00355
Septicemia (except in labor)	0.007	1.00728	0.69177
Mycoses	0.003	1.00269	0.91278
Hepatitis	0.074	1.07709	0.00087
Viral infection	-0.039	0.96167	0.18629
Sexually transmitted infections (not HIV or hepatitis)	-0.044	0.95728	0.55167
Immunizations and screening for infectious disease	-0.059	0.94307	0.00007
Cancer of other GI organs; peritoneum	-0.166	0.84717	0.20342
Cancer of bone and connective tissue	-0.056	0.94579	0.72901
Melanomas of skin	0.174	1.18948	0.06588
Other non-epithelial cancer of skin	0.036	1.03668	0.43383
Cancer of breast	-0.054	0.94749	0.20535
Cancer of cervix	-0.076	0.92688	0.32812
Cancer of ovary	0.203	1.22497	0.06527
Cancer of prostate	-0.096	0.90869	0.02665
Cancer of kidney and renal pelvis	0.061	1.06277	0.11126
Multiple myeloma	0.188	1.20688	0.00346
Cancer; other and unspecified primary	0.118	1.1255	0.04823
Secondary malignancies	0.267	1.30575	0.00001
Maintenance chemotherapy; radiotherapy	0.150	1.16145	0.03308
Benign neoplasm of uterus	-0.172	0.84182	0.0197
Other and unspecified benign neoplasm	-0.037	0.96348	0.1129

Covariate	Estimate	Odds Ratio	P-value
Thyroid disorders	0.067	1.06881	0.00002
Diabetes mellitus without complication	-0.058	0.94389	0.00018
Diabetes mellitus with complications	-0.022	0.97877	0.2216
Nutritional deficiencies	-0.028	0.9728	0.03977
Disorders of lipid metabolism	-0.069	0.93296	0
Gout and other crystal arthropathies	0.015	1.01469	0.43189
Other nutritional; endocrine; and metabolic disorders	-0.029	0.9714	0.03714
Deficiency and other anemia	-0.036	0.96504	0.28739
Sickle cell anemia	0.218	1.24329	0.00125
Coagulation and hemorrhagic disorders	-0.017	0.98303	0.30561
Diseases of white blood cells	-0.036	0.96438	0.10469
Other CNS infection and poliomyelitis	-0.150	0.86092	0.11721
Other hereditary and degenerative nervous system conditions	0.104	1.10958	0.00001
Paralysis	0.087	1.09055	0.02428
Headache; including migraine	-0.003	0.99752	0.90464
Coma; stupor; and brain damage	-0.004	0.99629	0.94144
Cataract	-0.044	0.95667	0.1218
Retinal detachments; defects; vascular occlusion; and retinopathy	0.001	1.00092	0.97866
Glaucoma	-0.014	0.98594	0.62747
Blindness and vision defects	0.008	1.00794	0.72267
Conditions associated with dizziness or vertigo	-0.057	0.94468	0.02205
Other ear and sense organ disorders	-0.091	0.91346	0.00084
Other nervous system disorders	0.252	1.28651	0
Heart valve disorders	-0.042	0.9586	0.01371
Peri-; endo-; and myocarditis; cardiomyopathy (except that caused by tuberculosis or sexually transmitted disease)	-0.039	0.96149	0.03121
Essential hypertension	-0.069	0.93335	0
Hypertension with complications and secondary hypertension	-0.081	0.92253	0.00026
Acute myocardial infarction	-0.049	0.95197	0.04293
Nonspecific chest pain	0.004	1.00346	0.83348
Pulmonary heart disease	0.046	1.04748	0.01013
Conduction disorders	-0.054	0.94785	0.00272
Cardiac arrest and ventricular fibrillation	-0.111	0.89513	0.03702
Congestive heart failure; nonhypertensive	-0.023	0.97723	0.12219
Acute cerebrovascular disease	-0.105	0.9003	0.00094
Transient cerebral ischemia	-0.067	0.93567	0.14652
Late effects of cerebrovascular disease	-0.169	0.84444	0
Peripheral and visceral atherosclerosis	-0.004	0.99635	0.8192
Hemorrhoids	0.014	1.01419	0.6243
Pneumonia (except that caused by tuberculosis or sexually transmitted disease)	-0.049	0.95218	0.00617

Covariate	Estimate	Odds Ratio	P-value
Influenza	-0.075	0.92738	0.14362
Acute bronchitis	-0.052	0.94953	0.05424
Other upper respiratory infections	-0.050	0.95093	0.02503
Chronic obstructive pulmonary disease and bronchiectasis	0.092	1.09627	0
Asthma	-0.019	0.9817	0.32031
Pleurisy; pneumothorax; pulmonary collapse	-0.029	0.97144	0.14122
Respiratory failure; insufficiency; arrest (adult)	0.021	1.02087	0.24263
Other lower respiratory disease	-0.028	0.9727	0.05377
Other upper respiratory disease	-0.069	0.93351	0.00275
Intestinal infection	-0.053	0.94856	0.04478
Diseases of mouth; excluding dental	0.145	1.15638	0.01049
Esophageal disorders	0.022	1.02268	0.10905
Gastroduodenal ulcer (except hemorrhage)	-0.024	0.97627	0.39495
Gastritis and duodenitis	-0.031	0.96906	0.1803
Other disorders of stomach and duodenum	0.074	1.07675	0.00123
Abdominal hernia	-0.051	0.95043	0.02548
Regional enteritis and ulcerative colitis	0.160	1.17296	0.01012
Intestinal obstruction without hernia	0.065	1.06682	0.07081
Diverticulosis and diverticulitis	-0.026	0.9739	0.28663
Peritonitis and intestinal abscess	-0.081	0.9221	0.01273
Other liver diseases	-0.039	0.96205	0.03022
Gastrointestinal hemorrhage	-0.024	0.97649	0.29637
Noninfectious gastroenteritis	-0.049	0.9522	0.07406
Nephritis; nephrosis; renal sclerosis	0.028	1.02841	0.29709
Acute and unspecified renal failure	0.021	1.02166	0.18122
Chronic kidney disease	0.012	1.0122	0.75177
Urinary tract infections	-0.008	0.99199	0.65902
Other diseases of kidney and ureters	-0.073	0.92946	0.0002
Genitourinary symptoms and ill-defined conditions	0.003	1.00341	0.8497
Other male genital disorders	0.066	1.06806	0.07377
Nonmalignant breast conditions	-0.035	0.96603	0.32803
Menopausal disorders	-0.025	0.97548	0.69471
Contraceptive and procreative management	0.010	1.00994	0.84579
Skin and subcutaneous tissue infections	0.006	1.00579	0.7407
Other inflammatory condition of skin	0.077	1.07992	0.00011
Chronic ulcer of skin	0.109	1.11525	0
Other skin disorders	-0.069	0.93361	0.00032
Infective arthritis and osteomyelitis (except that caused by tuberculosis or sexually transmitted disease)	0.045	1.04645	0.08991
Rheumatoid arthritis and related disease	0.189	1.20797	0
Osteoarthritis	0.100	1.10566	0

Covariate	Estimate	Odds Ratio	P-value
Other non-traumatic joint disorders	0.017	1.01687	0.30294
Spondylosis; intervertebral disc disorders; other back problems	0.194	1.21401	0
Osteoporosis	0.051	1.05267	0.08971
Acquired foot deformities	-0.066	0.93583	0.15961
Other acquired deformities	0.060	1.06176	0.08927
Other connective tissue disease	-0.005	0.99495	0.72989
Other bone disease and musculoskeletal deformities	-0.039	0.96227	0.03309
Digestive congenital anomalies	0.307	1.35905	0.00016
Genitourinary congenital anomalies	0.100	1.10555	0.00176
Nervous system congenital anomalies	-0.269	0.76398	0.02745
Joint disorders and dislocations; trauma-related	0.083	1.08673	0.16889
Spinal cord injury	-0.223	0.80004	0.1479
Fracture of upper limb	0.035	1.03587	0.38149
Fracture of lower limb	0.034	1.03419	0.31878
Sprains and strains	-0.065	0.93683	0.02243
Intracranial injury	-0.147	0.86358	0.00662
Open wounds of head; neck; and trunk	0.081	1.08445	0.04179
Open wounds of extremities	0.024	1.02409	0.3539
Poisoning by psychotropic agents	0.374	1.45412	0.00872
Poisoning by other medications and drugs	0.087	1.09108	0.06452
Poisoning by nonmedicinal substances	-0.094	0.91016	0.15689
Other injuries and conditions due to external causes	-0.003	0.9975	0.88747
Syncope	-0.098	0.9063	0.0002
Fever of unknown origin	0.026	1.02587	0.24395
Nausea and vomiting	0.043	1.04404	0.0074
Abdominal pain	-0.023	0.97721	0.18987
Malaise and fatigue	-0.072	0.93078	0.00002
Allergic reactions	0.042	1.04234	0.00387
Rehabilitation care; fitting of prostheses; and adjustment of devices	0.045	1.04616	0.52413
Administrative/social admission	-0.033	0.96726	0.09936
Medical examination/evaluation	-0.039	0.96185	0.02042
Other screening for suspected conditions (not mental disorders or infectious disease)	-0.020	0.98058	0.1758
Residual codes; unclassified	0.026	1.02622	0.09047
Adjustment disorders	0.016	1.01592	0.72919
Anxiety disorders	0.715	2.04336	0
Delirium dementia and amnestic and other cognitive disorders	-0.115	0.89114	0.00002
Developmental disorders	-0.147	0.86296	0.06367
Disorders usually diagnosed in infancy childhood or adolescence	0.350	1.41911	0.06508
Mood disorders	0.101	1.10613	0
Schizophrenia and other psychotic disorders	-0.018	0.98249	0.70663

Covariate	Estimate	Odds Ratio	P-value
Alcohol-related disorders	-0.109	0.89689	0.00166
Substance-related disorders	0.186	1.20437	0
Screening and history of mental health and substance abuse codes	0.046	1.04719	0.00071
Miscellaneous mental health disorders	0.142	1.1522	0.00116
External cause codes: Motor vehicle traffic (MVT)	0.043	1.04375	0.39326
External cause codes: Natural/environment	-0.054	0.94737	0.02303
External cause codes: Overexertion	0.175	1.1908	0.33187
Adverse effects of medical care	0.005	1.00535	0.70922

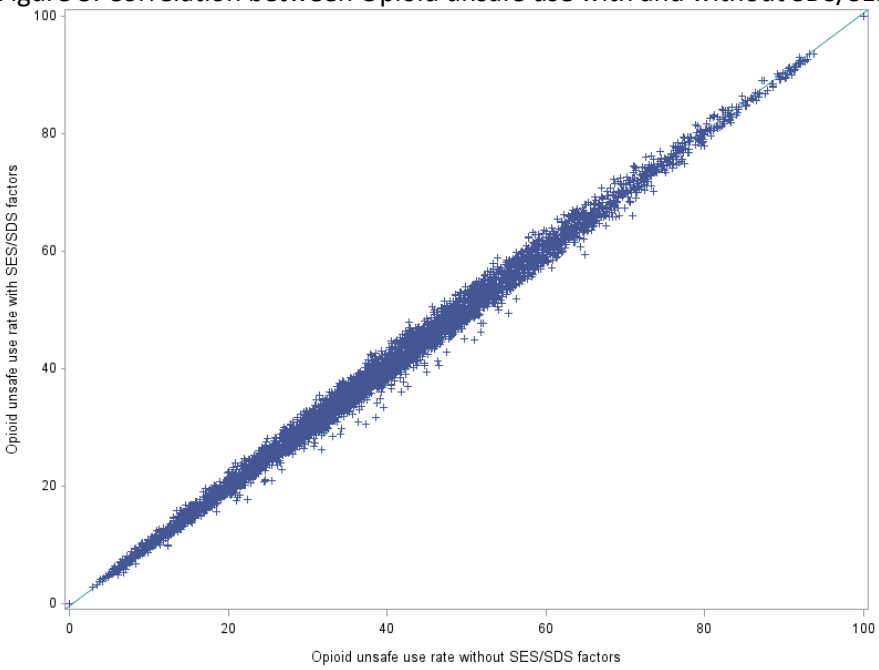
3.5.6 Analyses and Interpretation in Selection of Social Risk Factors (NQF Testing Attachment 2b3.4b.)

We fit an additional model including covariates from the original model and adding several SES/SDS indicators (dual-eligible insurance status, employment status at ESRD incidence, area deprivation index) as well as patient sex, race and ethnicity. Table 5 shows the associations from these selected additional covariates in the SES/SDS adjusted model.

Table 5. Coefficients and odds ratios for SDS/SES variables

Variable	Estimate	Odds Ratio	P-value
Sex			
Female	-0.031	0.969	0.015
Male	Reference		0.000
Ethnicity			
Hispanic	-0.305	0.737	<.0001
Non-Hispanic	Reference		0.000
Race			
White	Reference		0.000
Black	-0.307	0.735	<.0001
Other	-0.522	0.594	<.0001
Employment Status (2728)			
Employed	Reference		0.000
Unemployed	0.082	1.085	<.0001
Other	0.120	1.128	<.0001
Medicare Coverage			
Dual eligible	0.072	1.075	<.0001
Non dual eligible	Reference	0.000	0.000
ADI (zipcode_level)			
National percentile ADI score	-0.001	0.999	0.044

Figure 3. Correlation between Opioid unsafe use with and without SDS/SES adjustment



The correlation coefficient is 0.997 (p<.001).

Table 6. Comparison of performances with vs. without adjusting for SDS/SES factors

Opioid Unsafe use without SES/SDS	**Opioid Unsafe use with SES/SDS**			
	Better than Expected	**As Expected**	**Worse than Expected**	**Total**
Better than Expected	299 (5.8%)	10 (0.2%)	0	309 (6.3%)
As Expected	19 (0.4%)	4604 (89.9%)	12 (0.2%)	4635 (90.5%)
Worse than Expected	0	8 (0.2%)	171 (3.3%)	179 (3.5%)
Total	318 (6.2%)	4622 (90.2%)	183 (3.6%)	5123

These results show that there was only a small difference in the overall flagging rates between the models with and without SES/SDS adjusters. Specifically, fewer than 50 facilities (<1%) moved down or up one category and no facilities moved more than one category.

Though unsafe opioid use might be associated with white race, non-Hispanic ethnicity, dual eligible status, and unemployment (Table 5), these SDS/SES factors are not included in the final risk adjusted model as they play little roles in flagging; see the comments below Table 6. Furthermore, Figure 3 shows that unsafe opioid use measures based on models with and without SDS/SES factors are highly correlated. More importantly, while other studies have reported associations between patient-level race, ethnicity, and dual eligible status and unsafe opioid prescriptions, it is unclear whether these differences are due to underlying biological or other patient factors, or represent disparities in care. Adjusting for these social risk factors could have the unintended consequence of creating or reinforcing

disparities and facilitating unsafe prescribing practices. The primary goal should be to implement quality measures that result in the highest quality and safest patient care for all patients.

Finally, we comment that sex is the only SDS/SES factor that we include in our final risk adjustment model. Biologic differences (e.g. genetic, hormonal, metabolic) may account for differences in pain perception, suggesting a physiologic effect rather than a disparity in care.

3.5.7 Method Used to Develop the Statistical Model or Stratification Approach (NQF Testing Attachment 2b3.5.)

Risk factors were selected for the final model based on the magnitude of the coefficients, evaluation of their statistical significance, and the model C-statistic. The C-statistic measures the discriminative power of the regression model with considered risk factors. Two-way interactions were examined and selected for the final model based on both the magnitude and statistical significance of the estimates.

3.5.8 Statistical Risk Model Discrimination Statistics (e.g., c-statistic, R^2) (NQF Testing Attachment 2b3.6.)

The C-statistic (also known as the Index of Concordance) was 0.74, meaning that unsafe users had a 70% probability of having a higher model-based risk score than safe users. A 0.74 C-statistic indicates the model has a good distinguishing power to distinguish unsafe users from safe users.

3.5.9 Statistical Risk Model Calibration Statistics (e.g., Hosmer-Lemeshow statistic) (NQF Testing Attachment 2b3.7.)

To evaluate the goodness of fit of the developed risk prediction model, we ranked patients based on the predicted risk of unsafe use of opioids and grouped them into ten decile groups, with the lowest decile indicating the least risk and the highest decile the largest risk. Within each decile group, we computed the observed and expected numbers of unsafe users, based on our fitted model, as well as the standardized difference, i.e (Obs-Exp)/Exp. It appears that the standardized difference was almost negligible (with the maximum absolute value being 0.0407), indicating a reasonable good fit of our model on the data.

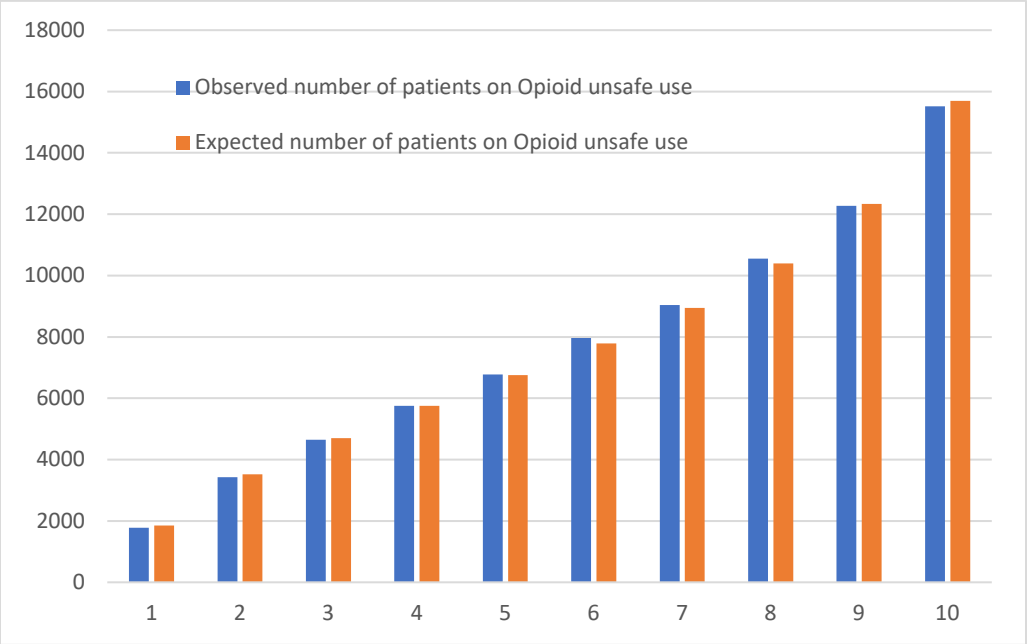
Table 7. Observed and expected numbers of Opioid unsafe uses and their standardized differences within each decile group.

Observed number of patients on Opioid unsafe use	**Expected number of patients on Opioid unsafe use**	**(Obs-Exp)/Exp**
1779	1854.55	-0.0407
3423	3515.56	-0.0263
4646	4700.2	-0.0115
5754	5754	-0.0000

Observed number of patients on Opioid unsafe use	Expected number of patients on Opioid unsafe use	(Obs-Exp)/Exp
6774	6755.48	0.0027
7970	7790.6	0.0230
9039	8945.99	0.0104
10550	10394.91	0.0149
12272	12331.84	-0.0049
15520	15691.88	-0.0110

3.5.10 Statistical Risk Model Calibration—Risk decile plots or calibration curves (NQF Testing Attachment 2b3.8.)

Figure 4. Observed and expected numbers of Opioid unsafe uses and their standardized differences within each decile group.



3.5.11 Results of Risk Stratification Analysis (NQF Testing Attachment 2b3.9.)

N/A

3.5.12 Interpretation (NQF Testing Attachment 2b3.10.)

The decile plot shows that the risk factors in the model are discriminating well between patients. There is good separation among all 10 groups and the ordering is as predicted by the model (patients predicted to be at lower risk have less unsafe opioid use). The absolute differences between the groups is also large with patients predicted to have the highest unsafe opioid use (group 10) having a 4 times higher rate than those predicted to have the lowest unsafe use (group 1).

3.5.13 Optional Additional Testing for Risk Adjustment (NQF Testing Attachment 2b3.11.)

N/A

3.6 Identification of Meaningful Differences in Performance **(for reference only)** (NQF Testing Attachment 2b.54.)

3.6.1 Method (NQF Testing Attachment 2b4.1.)

Differences in measure performance were evaluated separately for each prescriber group using patient level analyses. For each prescriber group, the proportion of patient-months with an unsafe opioid prescription, calculated at the year-level, was compared to the overall national distribution.

Note that the monthly based measure is a simple average of binary outcomes across individuals with the prescriber group, for which the binary outcome equals 0 if an unsafe opioid prescription is present, and equals 1 if an unsafe opioid prescription is present. The differences in proportions can be compared using Fisher's Exact tests or its normal approximation. The yearly based measure, however, is not a simple average of binary outcomes and we instead used a re-sampling based exact test, with re-sampling generated from the population distribution of the patient level outcomes. To address the issue of over and under-dispersion of the data, we used the empirical null approach to flag facilities. More specifically, we first calculate the p-value by assessing the probability that patients with each dialysis practitioner group would experience a number of events more extreme than what was actually observed if the null hypothesis were true, where the null hypothesis is that a patient with each dialysis practitioner group will follow the overall national distribution. We then convert these p-values to z-scores. Using the mid range of these scores (e.g. from the first quartile to the third quartile), we estimate the null distribution of the z-scores, which is termed the empirical null distribution. Finally, we use the 2.5 and 97.5 percentiles of the empirical null, as cut-offs, to determine the providers that fall into the categories of "worth than expected", "as expected" and "better than expected", respectively.

3.6.2 Statistical Results (NQF Testing Attachment 2b4.2.)

Table 8. Proportion of prescriber groups with statistically significant differences (p-value < 0.025)

Category	**Number of prescriber groups**	**Percent of prescriber groups**
Better than Expected	309	6.03
As expected	4635	90.47
Worse than expected	179	3.49

3.6.3 Interpretation (NQF Testing Attachment 2b4.3.)

For the annual percentage of patients with an unsafe opioid prescription as the performance measure, 4635 (90.5%) prescriber groups have achieved expected performance, 179 (3.5%) prescriber groups have performed worse than expected, and 309 (6.0%) have better than expected.

In general, lower rates of unsafe opioid prescriptions represent better quality of care. This analysis demonstrates both practical and statistically significant differences in performance across prescriber groups based on their proportion of patient months with unsafe opioid prescriptions.

3.7 Comparability of Multiple Data Sources/Methods **(for reference only)** (NQF Testing Attachment 2b5.)

3.7.1 Method (NQF Testing Attachment 2b5.1.)

N/A

3.7.2 Statistical Results (NQF Testing Attachment 2b5.2.)

N/A

3.7.3 Interpretation (NQF Testing Attachment 2b5.3.)

N/A

3.8 Missing Data Analysis and Minimizing Bias **(for reference only)** (NQF Testing Attachment 2b6.)

3.8.1 Method (NQF Testing Attachment 2b6.1)

Many data elements can be obtained from multiple sources and missing data occur rarely for covariates included in this measure. We assessed missing data for BMI which comes from form CMS 2728 which is the source of data used for the BMI risk adjustment in the model.

Ascertainment of prevalent comorbidities for risk adjustment relies on determining sufficient Medicare claims history. This is determined by the presence of 6 or more months of Medicare coverage in the prior 12 months OR 1 or more Medicare Advantage patient months in the prior 12 months. Medicare Advantage patient status was defined using Medicare Enrollment Database (EDB) criteria. We assessed the extent of incomplete comorbidity ascertainment for comorbidity risk adjustment.

3.8.2 Missing Data Analysis (NQF Testing Attachment 2b6.2)

Table 9. Frequency of missing data elements, 2017 data

Data Element	**Missing (%)**
Patients with missing CMS 2728	1.2%
Patients without BMI reported on 2728	2.1%
Patients where we are unable to determine presence of prevalent comorbidities	8.4%

3.8.3 Interpretation (NQF Testing Attachment 2b6.3)

There is a very low fraction of patients with missing BMI, missing form 2728, and missing cause of ESRD. Missing Cause of ESRD and missing 2728 were accounted for with a category for missingness in the model. Patients with missing BMI were included in the BMI 30+ category.

4. Feasibility (NQF Feasibility Tab)

4.1 Data Elements Generated as Byproduct of Care Processes (NQF Measure evaluation criterion 3a./3a.1)

Data used in the measure are (check all that apply)

☒generated or collected by and used by healthcare personnel during provision of care (e.g., blood pressure, laboratory value, diagnosis, depression score)
☒coded by someone other than the person obtaining original information (e.g., Diagnosis-Related Group [DRG], International Classification of Diseases, 10th Revision [ICD-10] codes on claims)
☐abstracted from a record by someone other than the person obtaining original information (e.g., chart abstraction for quality measure or registry)
☐other (please describe) Click or tap here to enter text.

4.2 Electronic Sources (NQF Measure evaluation criterion 3b.)

N/A

4.2.1 Data Elements Electronic Availability (NQF Submission Form 3b.1.)

☐All data elements are in defined fields in EHRs.
☐All data elements are in defined fields in electronic claims.
☐All data elements are in defined fields in electronic clinical data such as clinical registry, nursing home MDS, and home health OASIS.
☒All data elements are in defined fields in a combination of electronic sources.
☐Some data elements are in defined fields in electronic sources.
☐No data elements are in defined fields in electronic sources.
☐Data are patient/family reported information; may be electronic or paper.

4.2.2 Path to Electronic Capture (NQF Submission Form 3b.2.)

N/A

4.2.3 eCQM Feasibility (NQF Submission Form 3b.3.)

N/A

4.3 Data Collection Strategy (NQF Measure evaluation criterion 3c.)

4.3.1 Data Collection Strategy Difficulties (optional) (NQF Submission Form 3c.1.)

N/A

4.3.2 Fees, Licensing, Other Requirements (NQF Submission Form 3c.2.)

N/A

5. Usability and Use (NQF Usability and Use Tab)

5.1 Use (NQF Measure evaluation criterion 4a.)

5.1.1 Current and Planned Use (NQF Submission Form 4.1.)

☒public reporting (PLANNED)
☐public health or disease surveillance
☒payment program (PLANNED)
☐regulatory and accreditation programs
☐professional certification or recognition program
☐quality improvement with external benchmarking to multiple organizations
☐quality improvement internal to a specific organization
☐not in use
☒use unknown

5.1.1.1 Reasons for Not Publicly Reporting or Use in Other Accountability Application (NQF Submission Form 4a.1.2.)

The measure is undergoing initial endorsement review.

5.1.1.2 Plan for Implementation (NQF Submission Form 4a.1.3.)

CMS will determine if/when to report this measure in a public reporting/payment program.

5.1.2 Feedback on the Measure by Those Being Measured or Others (NQF Measure evaluation criterion 4a2)

5.1.2.1 Technical Assistance Provided During Development or Implementation (NQF Submission Form 4a2.1.1.)

N/A

5.1.2.2 Technical Assistance with Results (NQF Submission Form 4a2.1.2.)

N/A

5.1.2.3 Feedback on Measure Performance and Implementation (NQF Submission Form 4a2.2.1.)

N/A

5.1.2.4 Feedback from Measured Providers (NQF Submission Form 4a2.2.2.)

N/A

5.1.2.5 Feedback from Other Users (NQF Submission Form 4a2.2.3.)

N/A

5.1.2.6 Consideration of Feedback (NQF Submission Form 4a2.3.)

N/A

5.2 Usability (NQF Measure evaluation criterion 4b)

5.2.1 Improvement (NQF Measure evaluation criterion 4b1.)

The measure is not yet implemented in a public reporting program, so improvement could not be evaluated. CMS currently anticipates implementation of this unsafe opioid measure. Once implemented practitioner performance on the measure can be evaluated to determine if the measure has supported and detected quality improvement in reducing unsafe opioid use, while accounting for patients where higher dose or longer term therapy may be warranted.

5.2.2 Unexpected Findings (NQF Measure evaluation criterion 4b2., NQF Submission Form 4b2.1.)

N/A

5.2.3 Unexpected Benefits (NQF Submission Form 4b2.2.)

N/A

6. Related and Competing Measures (NQF Related and Competing Measures Tab)

6.1 Relation to Other NQF-Endorsed Measures (NQF Measure evaluation criterion 5, NQF Submission Form 5)

Are there related measures or competing measures?

☐yes
☒no

6.2 Harmonization (NQF Submission Form 5a., 5a.1., 5a.2.)

N/A

6.3 Competing Measures (NQF Submission Form 5b., 5b.1.)

N/A